

ESTIONE CASE LAVORATORI

(LEGGE 14.2.1963 N° 60) INTERVENTO N° 1/AZ

STAZIONE APPALTANTE

I.A.C.P.

QUARTIERE "S.ELIA" BRINDISI
Edilizia Sovvenzionata

data

5.VI.68

aggiornamento

aggiornamento

aggiornamento

R
1

RELAZIONE DI CALCOLO

arch.

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PROGRAMMAZIONE

note

controllo

visto

I.A.C.P.

DIREZIONE LAVORI

Il lotto comprende n°4 palazzine di 3 diversi tipi composte ciascuna di piano terra, tre o quattro piani abitazioni.

Le strutture sono del tipo tradizionale in c.a. costituite da pilastri, travi a spessore o di calata, solai in latero-cemento, sporti in latero-cemento, scale in c.a. a sbalzo da travi a ginocchio, murature perimetrali a doppia foderà in laterizio.

I solai di calpestio e di copertura sono previsti dell'altezza di cm 25, compresa la soletta collaborante di cm 5, con interasse 50 cm, mentre per le zone ribassate dei servizi l'altezza di diviene di cm 16.

Le fondazioni sono a travi rovesce in c.a. dell'altezza di cm 100. Le fondazioni sono state proporzionate per un carico di circa 1,5 Kg/cm² sul terreno.

Si è previsto l'uso di calcestruzzo classe 250 dosato a 3 ql/mc di cemento tipo 730, ferro tondo omogeneo Aq 42.

Le sollecitazioni massime nel calcestruzzo armato sono:

- 70 Kg/cm² per le strutture sollecitate a flessione e presso flessione
- 45 Kg/cm² per le strutture sollecitate a pressione semplice.

I calcoli sono stati eseguiti con l'ausilio del regolo calcolatore.

Analisi generale dei carichi

Solai in latero-cemento	$H = 20'' + 5''$	$i = 50''$
p.p.		160
soletta	$0,05 \times 1,00 \times 1,00 \times 2500$	125
sovracc. perm.		115
" accid.		200
		600 Kg/mq

Muratura

Muratura a doppia fodera di mattoni forati e tufo

Fodera esterna	$80 \times 2,90$	230
" interna	$170 \times 2,90$	470
		700 Kg/ml

Balconi a sbalzo in latero-cemento $H = 20'' + 5''$

p.p.		140
soletta		100
sovracc. perm.		160
" accid.		400
		800 Kg/mq

Scale

gradini a sbalzo da trave a ginocchio

p.p.	$\frac{20+4}{2} \times 1,00 \times 1,00 \times 2500$	300
sovracc. perm.		100
sovracc. accid.		400
		800 Kg/mq

Sovraccarico travi piatte

sovracc. perm.		115
" accid.		200
		315 Kg/mq

PALAZZINA TIPO B

Analisi di carico sulle travi

Travi 1-2; 1'-2';

solaio	$600 \times \frac{4,30}{2}$	1300
tompagno		700
sovracc. trave	$315 \times 1,00$	300
p.p.		650
		2950 Kg/ml

Trave 2-3-4; 2'-3'-4';

solaio		1300
sbalzo	$800 \times 0,5$	400
sovracc. trave		300
tompagno		700
p.p.		650
		3350 Kg/ml

Trave 5-6-7; 5'-6'-7';

Solaio		1300
solaio	$600 \times \frac{3,50}{2}$	1050
sovracc. trave		250
p.p.		450
		3050 Kg/ml

Trave 7-8; 7'-8';

Solaio		1300
"	$600 \times \frac{2,60}{4}$	400
sovracc. trave		250
p.p.		450
		2400 Kg/ml

Trave 7-9; 7'-9'

solaio	1050
"	400
sovracc. trave	250
p.p.	450
	2150 Kg/ml

Trave 10-11-12-13; 10'-11'-12'-13';

solaio	1050
balcone	800 x 1,20 950
sovracc. trave	250
tompagno	700
p.p.	450
	3400 Kg/ml

Trave (9-9') - 13-S (da contarsi due volte)

solaio	$600 \times \frac{2,60}{4}$ 400
tompagno	700
p.p.	300
	1400 Kg/ml

Trave 9-9'; (da contarsi due volte)

solaio	400
tompagno	700
p.p.	300
	1400 Kg/ml

Carico della 13-(9-9)' in mezzeria $1400 \times \frac{1,75}{2}$ 1200 Kg

Trave 9 - 9' (a ginocchio)

rampa	800 x 1,20	950
p.p.		350
		1300 Kg/ml

Trave 8 - 14 - 8'

Rampa		950
tompagno		700
p.p.		350
		2000 Kg/ml

Trave 1-5-10; 1'-5'-10'; 4-8; 4'-8';

tompagno		700
p.p.		300
		1000 Kg/ml

Analisi di carico sui pilastri

Pilastro 1; 1';

1 - 2	$2950 \times \frac{3,90}{2}$	5800
1 - 5	$1000 \times \frac{5,40}{2}$	2700
p.p.		1500
		10000 Kg

Pilastro 2; 2';

2 - 1		5800
2 - 3	$3350 \times \frac{3,80}{2}$	6400
p.p.		1300
		13500 Kg

Pilastro 3; 3';

3 - 2		6400
3 - 4	$3350 \times \frac{2,50}{2}$	4200
p.p.		1400
		12000 Kg

Pilastro 4; 4';

4 - 3		4200
4 - 8	$1000 \times \frac{5,00}{2}$	2500
p.p.		1300
		8000 Kg

Pilastro 5; 5';

5 - 1		2700
5 - 10	$1000 \times \frac{4,30}{2}$	2200
5 - 6	$3050 \times \frac{3,00}{2}$	4600
p.p.		1500
		11000 Kg

Pilastro 6; 6';

6 - 5		4600
6 - 7	$3050 \times \frac{3,00}{2}$	4600
p.p.		1300
		10500 Kg

Pilastro 7, 7';

7 - 6		4600
7 - 8	$2400 \times \frac{4,00}{2}$	4800
7 - 9	$2150 \times \frac{3,20}{2}$	3500
p.p.		1100
		14000 Kg

Pilastro 8; 8';

8 - 4		2500
8 - 7		4800
8 - 14	$2000 \times \frac{2,15}{2}$	2150
p.p.		1550
		11000 Kg

Pilastro 9; 9';

9 - 7		3500
9 - 9'	$(1400 \times \frac{2,70}{2} + \frac{1200}{2}) \times 2$	5000
9 - 9' (a ginocchio)	$1300 \times \frac{2,70}{2}$	1800
p.p.		1200
		11500 Kg

Pilastro 10; 10'

10 - 5		2200
10 - 11	$3400 \times \frac{3,00}{2}$	5100
p.p.		1200
		8500 Kg

Pilastro 11; 11';

11 - 10		5100
11 - 12		5100
p.p.		1300
		11500 Kg

Pilastro 12; 12';

12 - 11		5100
12 - 13	$3400 \times \frac{2,40}{2}$	4100
p.p.		1300
		10500 Kg

Pilastro 13

13 - 12		4100
13 - 12'		4100
13 - S	$1400 \times 1,25 \times 2$	3500
13 - (9-9')	1200×2	2400
p.p.		1400
		15500 Kg

Pilastro 14

14 - 8	$2000 \times \frac{2,15}{2}$	2150
14 - 8'		2150
p.p.		1200
		5500 Kg

Armatura travi rovesce

Analisi di carico sul terreno

pilastri	1.394.000 Kg
p.p.	156.000 Kg
	<u>1.550.000 Kg</u>

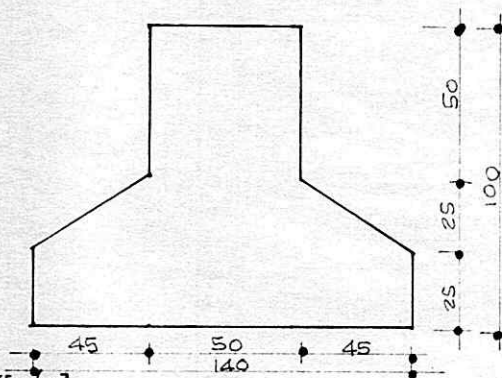
- Tensione sul terreno -

$$t = \frac{1.550.000}{1.056.000} = 1,46 \text{ Kg/cm}^2$$

Travi 1-2-3-4; 1'-2'-3'-4'; 5-6-7-8; 5'-6'-7'-8'; 10-11-12-13-9';
10'-11'-12'-13'-9';

Caratteristiche geometriche

vedi disegno



- Carico sulla trave -

$$q = \frac{1.394.000}{1.056.000} \times 100 \times 140 = 18500 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} 18.500 \times 3,30^2 = 16900 \text{ Kgm}$$

$$H = 100''$$

$$b = 50''$$

$$f = 1400 \text{ Kg/cm}^2$$

$$c = 37 \text{ Kg/cm}^2$$

$$A_f = 13,4 \text{ cm}^2$$

$$M_{camp} = 16900 \text{ Kgm}$$

$$H = 100''$$

$$b = 140''$$

$$f = 1400 \text{ Kg/cm}^2$$

$$c = 21 \text{ Kg/cm}^2$$

$$A_f = 13,2 \text{ cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 18.500 \times 0,45^2 = 1800 \text{ Kgm}$$

$$H = 50''$$

$$b = 100''$$

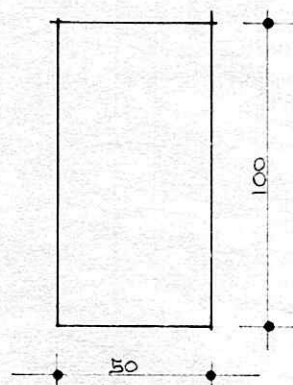
$$f = 1400 \text{ Kg/cmq}$$

$$c = 15 \text{ Kg/cmq}$$

$$A_f = 2,6 \text{ cmq/ml}$$

Trave 1-5-10; 1'-5'-10'; 4-8; 4'-8'; 8-14-8'; 9-9';

- Caratteristiche geometriche -
vedi disegno



$$q = 1,32 \times 100 \times 50 = 6600 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = M_{camp} = \frac{1}{12} 6600 \times 5,40^2 = 16.000 \text{ Kgm}$$

$$H = 100''$$

$$b = 50''$$

$$f = 1400 \text{ Kg/cmq}$$

$$c = 35 \text{ Kg/cmq}$$

$$A_f = 12,4 \text{ cmq}$$

SEZIONE ED ARMATURA PILASTRI PIANO TERRA E FONDAZIONI

N°	P/tn	A' _c /cmq	A _f / cmq	armatura	A _c /cmxcm	A _{ci} /cmq	$\bar{c}$ /cmq
1; 1';	50	1030	8,25	10 $\varnothing$ 14	$\varnothing$ 50	2116	24
2; 2';	68	1400	11,2	10 $\varnothing$ 14	$\varnothing$ 50	2116	32
3; 3';	60	1230	9,8	10 $\varnothing$ 14	$\varnothing$ 50	2116	28
4; 4';	40	850	6,8	10 $\varnothing$ 14	$\varnothing$ 50	2116	19
5; 5';	55	1130	9,0	10 $\varnothing$ 14	$\varnothing$ 50	2116	26
6; 6';	53	1100	8,8	10 $\varnothing$ 12	40 x 40	1713	31
7; 7';	70	1440	11,5	10 $\varnothing$ 12	40 x 40	1713	41
8; 8';	55	1130	9,0	10 $\varnothing$ 12	40 x 40	1713	32
9; 9';	58	1200	9,6	10 $\varnothing$ 12	25 x 50	1363	42
10; 10';	43	880	7,0	10 $\varnothing$ 14	$\varnothing$ 50	2116	20
11; 11';	58	1200	9,6	10 $\varnothing$ 14	$\varnothing$ 50	2116	27
12; 12';	53	1100	8,8	10 $\varnothing$ 14	$\varnothing$ 50	2116	25
13	78	1600	12,8	10 $\varnothing$ 14	$\varnothing$ 50	2116	37
14	28	570	4,6	8 $\varnothing$ 12	25 x 40	1090	26

Staffe $\varnothing$ 8'''/15''

SEZIONE ED ARMATURA PILASTRI PIANO I° e II°

pil. n°	sezione	armatura
1; 1';	35 x 35	10 $\varnothing$ 12
2; 2';	35 x 35	10 $\varnothing$ 12
3; 3';	35 x 35	10 $\varnothing$ 12
4; 4';	35 x 35	10 $\varnothing$ 12
5; 5';	35 x 35	10 $\varnothing$ 12
6; 6';	35 x 35	8 $\varnothing$ 12
7; 7';	35 x 35	8 $\varnothing$ 12
8; 8';	30 x 40	8 $\varnothing$ 12
9; 9';	25 x 40	8 $\varnothing$ 12
10; 10';	35 x 35	10 $\varnothing$ 12
11; 11';	$\varnothing$ 40	10 $\varnothing$ 12
12; 12';	$\varnothing$ 40	10 $\varnothing$ 12
13	35 x 35	10 $\varnothing$ 12
14	25 x 40	8 $\varnothing$ 12

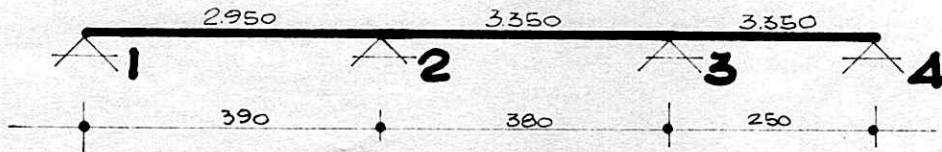
Staffe $\varnothing$ 6"/15"

SEZIONE ED ARMATURA PILASTRI PIANO III° e IV°

pil.n°	sezione	armatura
1; 1';	30 x 30	8 $\varnothing$ 10
2; 2';	30 x 30	8 $\varnothing$ 10
3; 3';	30 x 30	8 $\varnothing$ 10
4; 4';	30 x 30	8 $\varnothing$ 10
5; 5';	30 x 30	8 $\varnothing$ 10
6; 6';	30 x 30	8 $\varnothing$ 10
7; 7';	30 x 30	8 $\varnothing$ 10
8; 8';	25 x 40	8 $\varnothing$ 10
9; 9';	25 x 30	8 $\varnothing$ 10
10; 10';	30 x 30	8 $\varnothing$ 10
11; 11';	$\varnothing$ 30	8 $\varnothing$ 10
12; 12';	$\varnothing$ 30	8 $\varnothing$ 10
13	30 x 30	8 $\varnothing$ 10
14	25 x 30	8 $\varnothing$ 10

Staffe $\varnothing$ 6"/15"

Travi n°1-2-3-4; 1'-2'-3'-4';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 100''$$

Sezione 1; 1-2;

$$M = \frac{1}{14} 2950 \times 3,90^2 = 3200 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 10,9 \text{ cm}^2$$

Sezione 2; 3;

$$M = \frac{1}{12} 3350 \times 3,80^2 = 4000 \text{ Kgm}$$

$$\sigma_c = 58 \text{ Kg/cm}^2$$

$$A_f = 13,9 \text{ cm}^2$$

Sezione 2 - 3

$$M = \frac{1}{16} 3350 \times 3,80^2 = 3050 \text{ Kgm}$$

$$\sigma_c = 49 \text{ Kg/cm}^2$$

$$A_f = 10,4 \text{ cm}^2$$

Sezione 3-4; 4;

$$M = \frac{1}{14} 3350 \times 2,50^2 = 1500 \text{ Kgm}$$

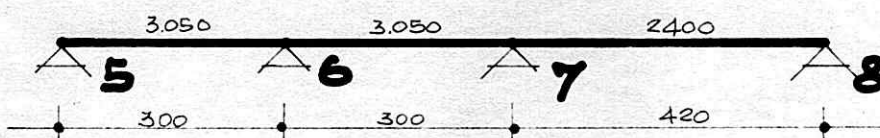
$$\sigma_c = 32 \text{ Kg/cm}^2$$

$$A_f = 4,9 \text{ cm}^2$$

Taglio massimo $T = 6400 \text{ Kg}$

$$\tau_{\max} = \frac{6400}{100 \times 0,9 \times 23} = 3,1 \text{ Kg/cm}^2$$

Travi n°5-6-7-8; 5'-6'-7'-8';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 5; 5-6;

$$M = \frac{1}{14} 3050 \times 3,00^2 = 1950 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,6 \text{ cm}^2$$

Sezione 6;

$$M = \frac{1}{12} 3050 \times 3,00^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 51 \text{ Kg/cm}^2$$

$$A_f = 7,9 \text{ cm}^2$$

Sezione 6-7;

$$M = \frac{1}{16} 3050 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 5,8 \text{ cm}^2$$

Sezione 7;

$$M = \frac{1}{12} 2400 \times 4,20^2 = 3500 \text{ Kgm}$$

$$\sigma_c = 65 \text{ Kg/cm}^2$$

$$A_f = 11,9 \text{ cm}^2$$

Sezione 7-8; 8;

$$M = \frac{1}{14} 2400 \times 4,20^2 = 3000 \text{ Kgm}$$

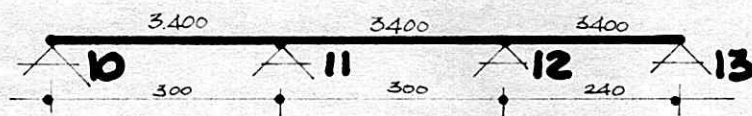
$$\sigma_c = 60 \text{ Kg/cm}^2$$

$$A_f = 10,3 \text{ cm}^2$$

Taglio massimo $T = 5000 \text{ Kg}$

$$\tau_{\max} = \frac{5000}{23 \times 0,9 \times 70} = 3,5 \text{ Kg/cm}^2$$

Travi n°10-11-12-13; 10'-11'-12'-13';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 10; 10-11;

$$M = \frac{1}{14} 3400 \times \overline{3,00}^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 7,5 \text{ cm}^2$$

Sezione 11; 12;

$$M = \frac{1}{12} 3400 \times \overline{3,00}^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 8,6 \text{ cm}^2$$

Sezione 11-12;

$$M = \frac{1}{16} 3400 \times \overline{3,00}^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 12-13; 13;

$$M = \frac{1}{14} 3400 \times \overline{2,40}^2 = 1400 \text{ Kgm}$$

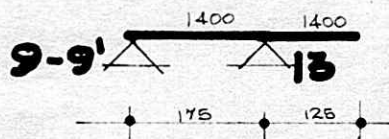
$$\sigma_c = 38 \text{ Kg/cm}^2$$

$$A_f = 4,7 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{23 \times 0,9 \times 20} = 3,5 \text{ Kg/cm}^2$$

Travi n° (9-9')-13-S



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 25''$$

Sezione (9-9')-; (9-9')-13

$$M = \frac{1}{14} 1400 \times \overline{1,75}^2 = 310 \text{ Kgm}$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 1 \text{ cm}^2$$

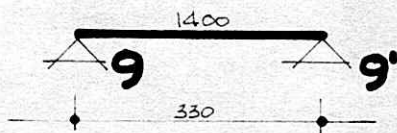
Sezione 13

$$M = \frac{1}{2} 1400 \times \overline{1,25}^2 = 1100 \text{ Kgm}$$

$$\sigma_c = 26 \text{ Kg/cm}^2$$

$$A_f = 1,75 \text{ cm}^2$$

Trave n° 9 - 9'



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 29''$$

Sezione 9; 9'; 9-9';

$$M = \frac{1}{12} 1400 \times 3,30^2 = 1250 \text{ Kgm}$$

$$\sigma_c = 28 \text{ Kg/cm}^2$$

$$A_f = 2,0 \text{ cm}^2$$

Travi n°1-5-10; 1'-5'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

Sezione 1; 1-5;

$$M = \frac{1}{14} 1000 \times 5,40^2 = 2100 \text{ Kgm}$$

$$\sigma_c = 59 \text{ Kg/cm}^2$$

$$A_f = 7,2 \text{ cm}^2$$

Sezione 5

$$M = \frac{1}{12} 1000 \times 5,40^2 = 2400 \text{ Kgm}$$

$$\sigma_c = 64 \text{ Kg/cm}^2$$

$$A_f = 8,3 \text{ cm}^2$$

Sezione 5-10; 10;

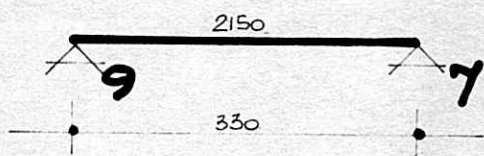
$$M = \frac{1}{14} 1000 \times 4,30^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2 \quad A_f = 4,4 \text{ cm}^2$$

Taglio massimo $T = 2700 \text{ Kg}$

$$\tau_{\max} = \frac{2700}{23 \times 0,9 \times 50} = 2,6 \text{ Kg/cm}^2$$

Trave n° 9 - 7



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

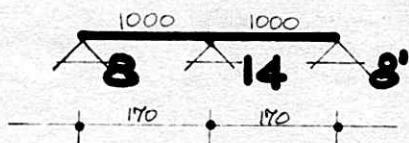
Sezione 9; 9-7; 7

$$M = \frac{1}{12} 2150 \times 3,30^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Trave n°8-14-8'



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 25''$$

Sezione 8; 14; 8';

$$M = \frac{1}{12} 1000 \times 1,70^2 = 250 \text{ Kgm}$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 11 \text{ cm}^2$$

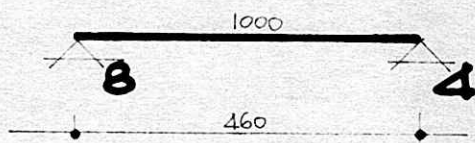
Sezione 8-14; 14-8';

$$M = \frac{1}{16} 1000 \times 1,70^2 = 200 \text{ Kgm}$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 1 \text{ cm}^2$$

Trave n°8-4; 8'-4';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

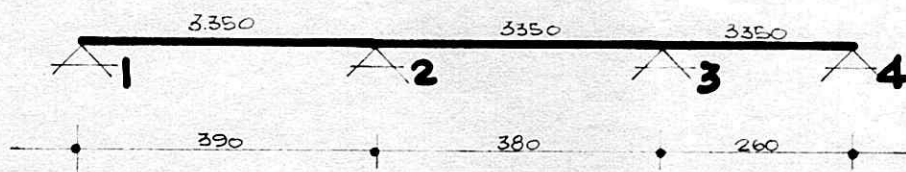
Sezione 8; 4; 8-4;

$$M = \frac{1}{12} 1000 \times 4,60^2 = 1750 \text{ Kgm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

$$A_f = 6 \text{ cm}^2$$

Travi n°1-2-3-4; 1'-2'-3'-4';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 80''$$

Sezione 1; 2; 3;

$$M = \frac{1}{12} 3350 \times 3,90^2 = 4250 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 12 \text{ cm}^2$$

Sezione 1-2; 2-3;

$$M = \frac{1}{16} 3350 \times 3,90^2 = 3200 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 9 \text{ cm}^2$$

Sezione 3-4; 4;

$$M = \frac{1}{14} 3350 \times 2,60^2 = 1650 \text{ Kgm}$$

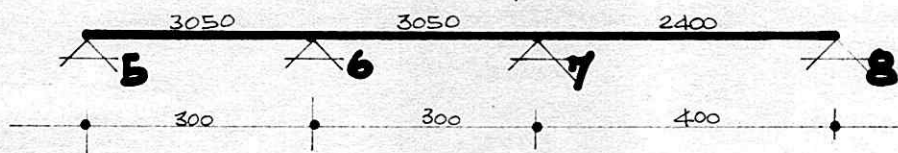
$$\sigma_c = 31 \text{ Kg/cm}^2$$

$$A_f = 4,5 \text{ cm}^2$$

Taglio massimo $T = 6500 \text{ Kg}$

$$\tau_{\max} = \frac{6500}{80 \times 0,9 \times 28} = 3,3 \text{ Kg/cm}^2$$

Travi n°5-6-7-8; 5'-6'-7'-8';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 5; 5-6;

$$M = \frac{1}{14} 3050 \times \overline{3,00}^2 = 1950 \text{ Kgm}$$

$$\sigma_c = 45 \text{ Kg/cm}^2 \quad A_f = 5,5 \text{ cm}^2$$

Sezione 6

$$M = \frac{1}{12} 3050 \times \overline{3,00}^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2 \quad A_f = 6,6 \text{ cm}^2$$

Sezione 6 - 8

$$M = \frac{1}{16} 3050 \times \overline{3,00}^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 41 \text{ Kg/cm}^2 \quad A_f = 4,7 \text{ cm}^2$$

Sezione 7

$$M = \frac{1}{12} 2400 \times \overline{4,00}^2 = 3200 \text{ Kgm}$$

$$\sigma_c = 60 \text{ Kg/cm}^2 \quad A_f = 9 \text{ cm}^2$$

Sezione 7 - 8; 8;

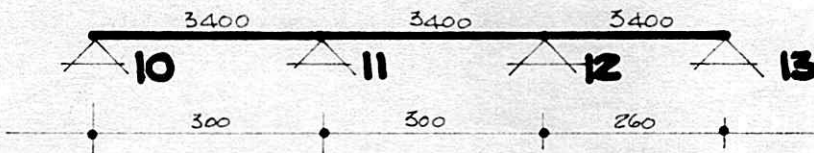
$$M = \frac{1}{14} 2400 \times \overline{4,00}^2 = 2750 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2 \quad A_f = 7,7 \text{ cm}^2$$

Taglio massimo $T = 4800 \text{ Kg}$

$$\tau_{\max} = \frac{4800}{28 \times 0,9 \times 50} = 3,8 \text{ Kg/cm}^2$$

Travi n°10-11-13; 10'-11'-12'-13';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 10; 11; 12;

$$M = \frac{1}{12} 3400 \times \overline{3,00}^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 7 \text{ cm}^2$$

Sezione 10-11; 11-12;

$$M = \frac{1}{16} 3400 \times \overline{3,00}^2 = 1950 \text{ Kgm}$$

$$\sigma_c = 45 \text{ Kg/cm}^2$$

$$A_f = 5,4 \text{ cm}^2$$

Sezione 12-13; 13;

$$M = \frac{1}{14} 3400 \times \overline{2,40}^2 = 1400 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 3,8 \text{ cm}^2$$

$$\text{Taglio massimo } T = 5100 \text{ Kg}$$

$$\tau_{\max} = \frac{5100}{28 \times 0,9 \times 50} = 4,0 \text{ Kg/cm}^2$$

Copertura piano tipo

Solaio

Solaio $H = 20'' + 5''$

p.p.		160
soletta	$0,05 \times 1,00 \times 1,00 \times 2500$	125
sovracc. perm.		115
sovracc. accid.		200
		600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 4,30 \times 1,05 = 4,50 \text{ m}$$

per $\sigma_f = 1400 \text{ Kg/cm}^2$	$H = 25''$	$b = 50''$
$M_{inc} = \frac{1}{12} 300 \times 4,50^2 = 500 \text{ Kgm}$	$\sigma_c = 26 \text{ Kg/cm}^2$	$A_f = 1,60 \text{ cm}^2$
$M_{camp} = \frac{1}{14} 300 \times 4,50^2 = 430 \text{ Kgm}$	$\sigma_c = 24 \text{ Kg/cm}^2$	$A_f = 1,38 \text{ cm}^2$

$$l = 350 \times 1,05 = 370 \text{ m}$$

per $\sigma_f = 1400 \text{ Kg/cm}^2$	$H = 25''$	$b = 50''$
$M_{inc} = \frac{1}{12} 300 \times 3,70^2 = 340 \text{ Kgm}$	$\sigma_c = 21 \text{ Kg/cm}^2$	$A_f = 1,12 \text{ cm}^2$
$M_{camp} = \frac{1}{12} 300 \times 3,70^2 = 290 \text{ Kgm}$	$\sigma_c = 19 \text{ Kg/cm}^2$	$A_f = 0,95 \text{ cm}^2$

Zone ribassate $H = 12'' + 4''$

p.p.		100
soletta	$0,04 \times 1,00 \times 1,00 \times 2500$	100
sovracc. perm.		150
sovracc. accid.		200
		550 Kg/mq

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 4,50 \text{ m} \quad \text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 16'' \quad b = 50''$$

$$M_{inc} = \frac{1}{12} 275 \times 4,50^2 = 460 \text{ Kgm} \quad \sigma_c = 44 \text{ Kg/cm}^2 \quad A_f = 2,55 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 275 \times 4,50^2 = 390 \text{ Kgm} \quad \sigma_c = 40 \text{ Kg/cm}^2 \quad A_f = 2,15 \text{ cm}^2$$

Sporti

p.p.	140
soletta	100
sovracc. perm.	110
sovracc. accid.	400
	750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml}$$

$$M = \frac{1}{2} 375 \times 1,20^2 = 270 \text{ Kgm} \quad H = 25'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 0,96 \text{ cm}^2$$

Solai di copertura

$$l = 4,50 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 30'' \quad b = 50''$$

$$M_{inc} = 500 \text{ Kgm} \quad \sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 1,3 \text{ cm}^2$$

$$M_{camp} = 420 \text{ Kgm} \quad \sigma_c = 20 \text{ Kg/cm}^2 \quad A_f = 1,15 \text{ cm}^2$$

$$l = 3,70 \text{ m} \quad \text{per } \sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 30'' \quad b = 50''$$

$$M_{inc} = 340 \text{ Kgm} \quad \sigma_c = 17 \text{ Kg/cm}^2 \quad A_f = 0,9 \text{ cm}^2$$

$$M_{camp} = 290 \text{ Kgm} \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_f = 0,75 \text{ cm}^2$$

Sporti

$$M = 270 \text{ Kgm}$$

$$H = 30''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 0,75 \text{ cm}^2$$

Vano scala

Analisi di carico

- gradino

p.p.	$\frac{20+3,5}{2} \times 1,00 \times 1,00 \times 2500$	300
sovracc. perm.		200
sovracc. accid.		400
		900 Kg/mq

- trave a ginocchio

rampa	900 x 1,15	1035
tompagno		350
p.p.		315
		1700 Kg/ml

Trave 9 - 9'

calcolo a flessione

$$M_{inc} = \frac{1}{12} 1700 \times 3,30^2 = 1550 \text{ Kgm} \quad H = 50'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 32 \text{ Kg/cm}^2 \quad A_f = 2,5 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 1700 \times 3,30^2 = 1300 \text{ Kgm} \quad H = 50'' \quad b = 25''$$

- a torsione

$$m_i = \frac{1}{2} 900 \times 1,15^2 = 595 \text{ Kgm} \quad t_i = 900 \times 1,15 = 1035 \text{ Kgm}$$

$$m_t = 595 \times 1035 \times 0,125 = 724 \text{ Kgm} \quad M_t = 724 \times \frac{3,00}{2} = 1085 \text{ Kgm}$$

$$\psi = 3 + \frac{50}{0,45 + \frac{50}{25}} = 4,06 \quad \tau_t = \frac{4,06 \times 1085}{50 \times 25^2} = 13,9 \text{ Kg/cm}^2$$

- Armatura a torsione $F = 45 \times 20 = 900 \text{ cm}^2$ $U = 2 (45+20) = 130 \text{ cm}$

$$\sum_{fc} = \frac{108.500 \times 130}{2 \times 1400 \times 900} = 5,59 \text{ cmq}$$

$$\sum_{fs} = \frac{108.500}{2 \times 1400 \times 900} = 0,043 \text{ cmq/cm}$$

Trave 8-14 $\equiv$ 8'-14';

Analisi di carico

rampa	1035
tompagno	700
p.p.	315
	2050 Kg/ml

- Calcolo a flessione

$$M_{inc} = \frac{1}{12} 2050 \times 1,70^2 = 500 \text{ Kgm} \quad H = 30'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 30 \text{ Kg/cm}^2 \quad A_f = 1,35 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2050 \times 1,70^2 = 420 \text{ Kgm} \quad H = 30'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 27 \text{ Kg/cm}^2 \quad A_f = 1,15 \text{ cm}^2$$

- A torsione

$$m_i = 595 \text{ Kgm} \quad t_i = 1035 \text{ Kg} \quad m_t = 724 \text{ Kgm}$$

$$M_t = 724 \times \frac{1,50}{2} = 503 \text{ Kgm} \quad \psi = 3 + \frac{2,6}{0,45 + \frac{30}{25}} = 4,57$$

$$\tau_t = \frac{4,57 \times 59.500}{30 \times 25^2} = 14 \text{ Kg/cm}^2$$

- Armatura a torsione $F = 20 \times 25 = 500 \text{ cm}^2$ $U = 2 \times (20 + 25) = 90 \text{ cm}$

$$\sum_{fc} = \frac{59.500 \times 90}{2 \times 1400 \times 500} = 3,8 \text{ cmq}$$

$$\sum_{fs} = \frac{59500}{2 \times 1400 \times 500} = 0,042 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,15^2 \times 0,30 = 180 \text{ Kgm} \quad H = \frac{20 + 3,5}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 50 \text{ Kg/cmq}$$

$$A_f = 1,47 \text{ cmq}$$

Copertura vani tecnici

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,40 \times 1,05 = 2,60 \text{ m}$$

$$M_{\text{inc}} = \frac{1}{14} 275 \times \overline{2,60}^2 = 130 \text{ Kgm}$$

$$H = 20''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 16 \text{ Kg/cm}^2$$

$$A_f = 0,55 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{10} 275 \times \overline{2,60}^2 = 190 \text{ Kgm}$$

$$H = 20''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 20 \text{ Kg/cm}^2$$

$$A_f = 0,79 \text{ cm}^2$$

Trave 9 - 9'

- Analisi di carico

solaio

$$550 \times \frac{2,40}{2}$$

$$= 660$$

p.p.

$$= 340$$

$$\frac{1000 \text{ Kg/ml}}{1000 \text{ Kg/ml}}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 25''$$

$$M_9 = M_{9'} = \frac{1}{12} 1000 \times \overline{3,20}^2 = 850 \text{ Kgm}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 23 \text{ Kg/cm}^2$$

$$A_f = 1,35 \text{ cm}^2$$

$$M_{9-9'} = \frac{1}{14} 1000 \times \overline{3,20}^2 = 750 \text{ Kgm}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 21 \text{ Kg/cm}^2$$

$$A_f = 1,2 \text{ cm}^2$$

Analisi di carico sulle travi

Trave 1-2; 1'-2';

Solaio	$600 \times \frac{4,20}{2}$	1250
sovracc. trave	$315 \times 1,10$	350
tompagno		700
p.p.	$1,10 \times 0,25 \times 1,00 \times 2500$	700
		3000 Kg/ml

Trave 2-3-4; 2'-3'-4';

Solaio		1250
sbalzo	$800 \times 0,50$	400
sovracc. trave		350
tompagno		700
p.p.		700
		3400 Kg/ml

Trave 5-6-7-8-10; 5'-6'-7'-8'-10';

Solaio		1250
solaio	$600 \times \frac{3,50}{2}$	1050
sovracc. trave	$315 \times 0,70$	250
p.p.	$0,70 \times 0,25 \times 1,00 \times 2500$	450
		3000 Kg/ml

Trave 12-13; 12'-13';

solaio		1050
sovracc. trave	$315 \times 0,70$	250
tompagno		700
p.p.		450
		2450 Kg/ml

Trave 13-14-15-16; 13'-14'-15'-16';

Solaio		1050
Sbalzo	800 x 1,20	950
sovracc. trave	315 x 0,70	250
tompagno		700
p.p.		450
		3400 Kg/ml

Trave 1-5-12; 1'-5'-12'; 10-11; 10'-11';

tompagno		700
p.p.	0,50 x 0,25 x 2500	300
		1000 Kg/ml

Trave 4-9-10; 4'-9'-10';

Rampa	800 x 1,20	950
tompagno		700
p.p.		350
		2000 Kg/ml

Trave 11'-11

Solaio	$600 \times \frac{2,25}{2}$	700
tompagno		700
p.p.		300
		1700 Kg/ml

Analisi di carico sui pilastri

Pilastro 1; 1';

1 - 2	$3000 \times \frac{4,20}{2}$	6300
1 - 5	$1000 \times \frac{5,40}{2}$	2700
p.p.		1500
		10500 Kg

Pilastro 2; 2';

2 - 1		6300
2 - 3	$3400 \times \frac{4,40}{2}$	7450
p.p.		1250
		15000 Kg

Pilastro 3; 3';

3 - 2		7450
3 - 4	$3400 \times \frac{2,10}{2}$	3550
p.p.		1500
		12500 Kg

Pilastro 4; 4';

4 - 3		3550
4 - 9	$2000 \times \frac{3,50}{2}$	3500
p.p.		1450
		8500 Kg

Pilastro 5; 5';

5 - 1		2700
5 - 6	$3000 \times \frac{3,10}{2}$	4700
5 - 12	$1000 \times \frac{4,30}{2}$	2150
p.p.		1450
		11000 Kg

Pilastro 6; 6';

6 - 5		4700
6 - 7	$3000 \times \frac{3,00}{2}$	4500
p.p.		1300
		10500 Kg

Pilastro 7; 7';

7 - 6		4500
7 - 8	$3000 \times \frac{2,90}{2}$	4450
p.p.		1550
		10500 Kg

Pilastro 8; 8';

8 - 7		4450
8 - 10	$3000 \times \frac{2,25}{2}$	3400
p.p.		1650
		9500 Kg

Pilastro 9; 9';

9 - 4		3500
9 - 10	$2000 \times \frac{2,05}{2}$	2050
p.p.		1450
		7000 Kg

Pilastro 10; 10';

10 - 8		3400
10 - 9		2050
10 - 11	$1000 \times \frac{1,30}{2}$	750
p.p.		1300
		7500 Kg

Pilastro 11; 11';

11 - 10		750
11 - 11'	$1700 \times \frac{1,75}{2}$	1500
p.p.		1250
		3500 Kg

Pilastro 12; 12';

12 - 5		2150
12 - 13	$2450 \times \frac{3,00}{2}$	3700
p.p.		1650
		7500 Kg

Pilastro 13; 13';

13 - 12		3700
13 - 14	$3400 \times \frac{3,00}{2}$	5100
p.p.		1200
		10000 Kg

Pilastro 14; 15; 16; 15' ; 14';

14 - 13		5100
14 - 15		5100
p.p.		1300
		12500 Kg

Armatura travi rovesce

- Analisi di carico sul terreno -

pilastrini	1.496.000 Kg
p.p. travi	180.000 Kg
	<u>1.676.000 Kg</u>

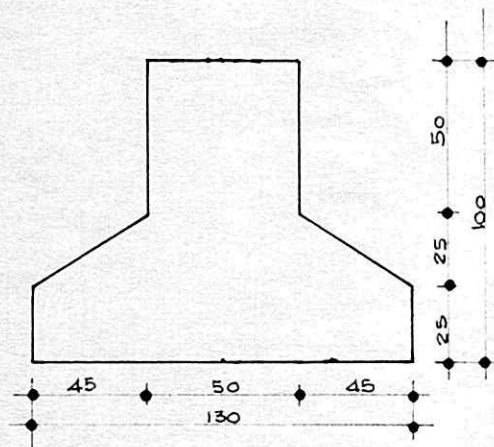
- Tensione sul terreno -

$$\sigma_t = \frac{1.676.000}{1.167.000} = 1,43 \text{ Kg/cm}^2$$

Travi 1-2-3-4; 4'-3'-2'-1';

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave -

$$q = \frac{1.496.000}{1.167.000} \times 100 \times 140 = 18.000 \text{ Kg/ml}$$

- Armatura a flessione -

$$M_{inc} = \frac{1}{12} 18.000 \times 4,40^2 = 29.000 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 50 \text{ Kg/cm}^2 \quad A_f = 23 \text{ cm}^2$$

$$M_{camp} = 29.000 \text{ Kgm} \quad H = 100'' \quad b = 40''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 22,8 \text{ cm}^2$$

- Armatura trasversale -

$$M = \frac{1}{2} 18.000 \times 0,45^2 = 1800 \text{ Kgm} \quad H = 50'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 15 \text{ Kg/cm}^2 \quad A_f = 2,6 \text{ cm}^2/\text{ml}$$

Trave 5-6-7-8-10-10'-8'-7'-6'-5'; 12-13-14-15-16-15'-14'-13'-12';

$$M_{inc} = \frac{1}{12} 18.000 \times 3,00^2 = 13500 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 32 \text{ Kg/cm}^2 \quad A_f = 10,5 \text{ cm}^2$$

$$M_{camp} = 13500 \text{ Kgm} \quad H = 100'' \quad b = 140''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 10,3 \text{ cm}^2$$

Trave 1-5-12; 4-9-10; 10-11-16; 10'-11'-16'; 4'-9'-10'; 1'-5'-12;

- Caratteristiche geometriche -

vedi disegno

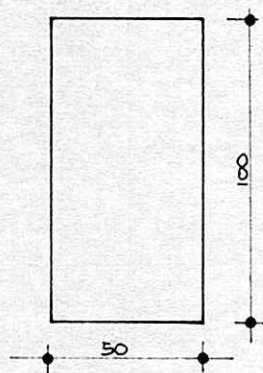
Carico sulla trave

$$1,28 \times 100 \times 50 = 6400 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{camp} = M_{inc} = \frac{1}{12} 6400 \times 5,40^2 = 15.600 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 35 \text{ Kg/cm}^2 \quad A_f = 12,2 \text{ cm}^2$$



SEZIONE ED ARMATURA PILASTRI PIANO FONDAZIONI E PIANO TERRA

N°	P/tn	A' _c / cmq	A _f / cmq	armatura	A _c / cmxcm	A _{ci} / cmq	σ _c / cmq
1; 1';	53	1080	8,65	10 ∅ 14	∅ 50	2116	25
2; 2';	75	1550	12,4	10 ∅ 14	∅ 50	2116	36
3; 3';	63	1300	10,4	10 ∅ 14	∅ 50	2116	30
4; 4';	43	890	7,10	10 ∅ 12	25 x 50	1363	32
5; 5';	55	1130	9,0	10 ∅ 14	∅ 50	2116	26
6; 6';	53	1080	8,65	10 ∅ 12	40 x 40	1713	31
7; 7';	53	1080	8,65	10 ∅ 12	40 x 40	1713	31
8; 8';	48	1000	8,0	10 ∅ 12	40 x 40	1713	28
9; 9';	35	720	5,75	10 ∅ 12	25 x 50	1363	26
10; 10';	38	780	6,25	8 ∅ 12	25 x 40	1090	35
11; 11';	18	370	3,00	8 ∅ 12	25 x 40	1090	17
12; 12';	38	780	6,25	10 ∅ 14	∅ 50	2116	18
13; 13';	50	1030	8,25	10 ∅ 14	∅ 50	2116	24
14; 15; 16; 14'; 15';	63	1300	10,40	10 ∅ 14	∅ 50	2116	30

Staffe ∅ 8'''/15"

SEZIONE ED ARMATURA PILASTRI PIANO I° e II°

pil. n°	sezione	armatura
1;1';	35 x 35	10 $\varnothing$ 12
2;2';	35 x 35	10 $\varnothing$ 12
3;3';	35 x 35	10 $\varnothing$ 12
4;4';	25 x 40	8 $\varnothing$ 12
5;5';	35 x 35	10 $\varnothing$ 12
6;6';	35 x 35	8 $\varnothing$ 12
7;7';	35 x 35	8 $\varnothing$ 12
8;8';	35 x 35	8 $\varnothing$ 12
9;9';	25 x 40	8 $\varnothing$ 12
10;10';	25 x 40	8 $\varnothing$ 12
11;11';	25 x 40	8 $\varnothing$ 12
12;12';	35 x 35	10 $\varnothing$ 12
13;13';	35 x 35	10 $\varnothing$ 12
14;15;16; 14';15';	35 x 35	10 $\varnothing$ 12

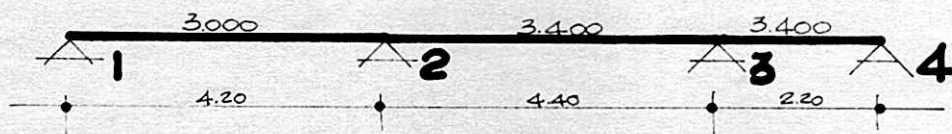
Staffe $\varnothing$ 6"/15"

SEZIONE ED ARMATURA PILASTRI PIANO III° e IV°

pil. n°	sezione	armatura
1; 1';	30 x 30	8 $\varnothing$ 10
2; 2';	30 x 30	8 $\varnothing$ 10
3; 3';	30 x 30	8 $\varnothing$ 10
4; 4';	25 x 30	8 $\varnothing$ 10
5; 5';	30 x 30	8 $\varnothing$ 10
6; 6';	30 x 30	8 $\varnothing$ 10
7; 7';	30 x 30	8 $\varnothing$ 10
8; 8';	30 x 30	8 $\varnothing$ 10
9; 9';	25 x 30	8 $\varnothing$ 10
10; 10';	25 x 30	8 $\varnothing$ 10
11; 11';	25 x 30	8 $\varnothing$ 10
12; 12';	30 x 30	8 $\varnothing$ 10
13; 13';	30 x 30	8 $\varnothing$ 10
14; 14'; 15; 15'; 16;	30 x 30	8 $\varnothing$ 10

Staffe $\varnothing$ 6"/15"

Trave n° 1-2-3-4; 1'-2'-3'-4';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 110''$$

Sezione 1; 1-2;

$$M = \frac{1}{14} 3000 \times 4,20^2 = 3800 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 12,8 \text{ cm}^2$$

Sezione 2; 3;

$$M = \frac{1}{12} 3400 \times 4,40^2 = 5500 \text{ Kgm}$$

$$\sigma_c = 66 \text{ Kg/cm}^2$$

$$A_f = 19,1 \text{ cm}^2$$

Sezione 2-3

$$M = \frac{1}{16} 3400 \times 4,40^2 = 4100 \text{ Kgm}$$

$$\sigma_c = 55 \text{ Kg/cm}^2$$

$$A_f = 14,0 \text{ cm}^2$$

Sezione 3-4; 4;

$$M = \frac{1}{14} 3400 \times 2,70^2 = 1200 \text{ Kgm}$$

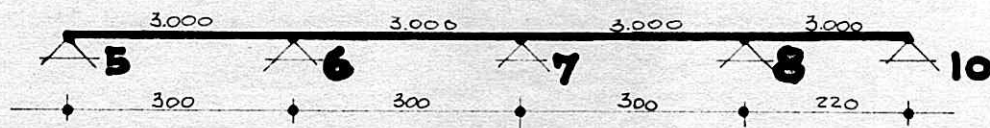
$$\sigma_c = 27 \text{ Kg/cm}^2$$

$$A_f = 4 \text{ cm}^2$$

Taglio massimo $T = 7500 \text{ Kg}$

$$\tau_{\max} = \frac{7500}{23 \times 0,9 \times 110} = 3,3 \text{ Kg/cm}^2$$

Trave n°5-6-7-8-10; 5'-6'-7'-8'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 5; 5-6;

$$M = \frac{1}{14} 3000 \times 3,00^2 = 1950 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,6 \text{ cm}^2$$

Sezione 6; 7; 8;

$$M = \frac{1}{12} 3000 \times 3,00^2 = 2250 \text{ Kgm}$$

$$\sigma_c = 50 \text{ Kg/cm}^2$$

$$A_f = 7,7 \text{ cm}^2$$

Sezione 6-7; 7-8;

$$M = \frac{1}{16} 3000 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 5,8 \text{ cm}^2$$

Sezione 8-10; 10;

$$M = \frac{1}{14} 3000 \times 2,20^2 = 1000 \text{ Kgm}$$

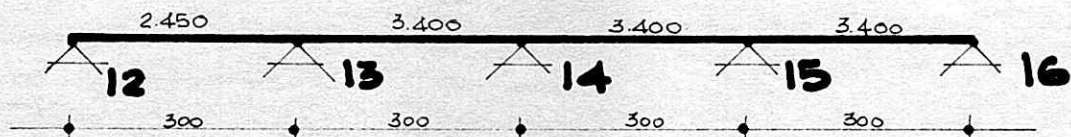
$$\sigma_c = 32 \text{ Kg/cm}^2$$

$$A_f = 3,4 \text{ cm}^2$$

Taglio massimo $T = 4500 \text{ Kg}$

$$\tau_{\max} = \frac{4500}{70 \times 0,9 \times 23} = 3,1 \text{ Kg/cm}^2$$

Travi n° 12-13-14-15-16-15'-14'-13'-12';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 12; 12-13;

$$M = \frac{1}{14} 2450 \times 3,00^2 = 1600 \text{ Kgm}$$

$$\sigma_c = 41 \text{ Kg/cm}^2$$

$$A_f = 5,4 \text{ cm}^2$$

Sezione 13; 14; 15; 16;

$$M = \frac{1}{12} 3400 \times 3,00^2 = 2550 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 8,7 \text{ cm}^2$$

Sezione 13-14; 14-15; 15-16;

$$M = \frac{1}{16} 3400 \times 3,00^2 = 1900 \text{ Kgm}$$

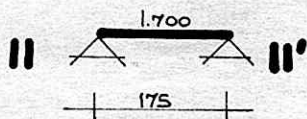
$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{23 \times 0,9 \times 70} = 3,5 \text{ Kg/cm}^2$$

Travi n° 11-11';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 20''$$

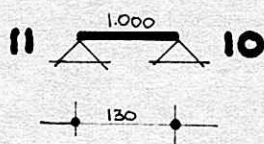
Sezione 11; 11'; 11-11';

$$M = \frac{1}{12} 1700 \times 1,75^2 = 450 \text{ Kgm}$$

$$\sigma_c = 18 \text{ Kg/cm}^2$$

$$A_f = 0,7 \text{ cm}^2$$

Trave n° 11-10 = 11'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 25''$$

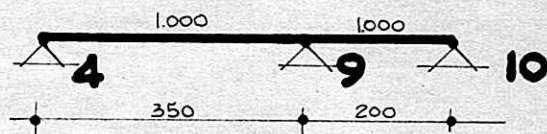
Sezione 11; 11-10; 10

$$M = \frac{1}{12} 1000 \times 1,30^2 = 200 \text{ Kgm}$$

$$\sigma_c < 15 \text{ Kg/cm}^2$$

$$A_f = 0,5 \text{ cm}^2$$

Trave n° 4-9-10; 4'-9'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 25''$$

Sezione 4; 4-9;

$$M = \frac{1}{14} 1000 \times 3,50^2 = 900 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 3,2 \text{ cm}^2$$

Sezione 9

$$M = \frac{1}{12} 1000 \times \overline{3,50}^2 = 1000 \text{ Kgm}$$

$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 3,4 \text{ cm}^2$$

Sezione 9-10; 10;

$$M = \frac{1}{14} 1000 \times \overline{2,00}^2 = 300 \text{ Kgm}$$

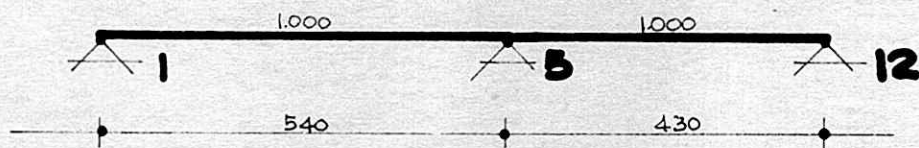
$$\sigma_c = 28 \text{ Kg/cm}^2$$

$$A_f = 1,05 \text{ cm}^2$$

Taglio massimo $T = 1750 \text{ Kg}$

$$\tau_{\max} = \frac{1750}{23 \times 0,9 \times 25} = 3,4 \text{ Kg/cm}^2$$

Travi n°1-5-12; 1'-5'-12';

**Armatura a Flessione**

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

Sezione 1; 1-5;

$$M = \frac{1}{14} 1000 \times \overline{5,40}^2 = 2100 \text{ Kgm}$$

$$\sigma_c = 59 \text{ Kg/cm}^2$$

$$A_f = 7,2 \text{ cm}^2$$

Sezione 5

$$M = \frac{1}{12} 1000 \times \overline{5,40}^2 = 2400 \text{ Kgm}$$

$$\sigma_c = 64 \text{ Kg/cm}^2$$

$$A_f = 8,4 \text{ cm}^2$$

Sezione 5-12; 12;

$$M = \frac{1}{14} 1000 \times \overline{4,30}^2 = 1300 \text{ Kgm}$$

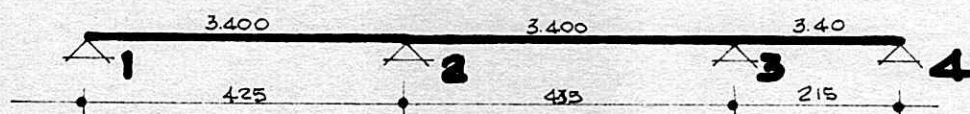
$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 4,4 \text{ cm}^2$$

Taglio massimo $T = 2700 \text{ Kg}$

$$\tau_{\max} = \frac{2700}{50 \times 0,9 \times 23} = 2,6 \text{ Kg/cm}^2$$

Travi n°1-2-3-4; 4'-3'-2'-1';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 80''$$

Sezione 1; 2; 3;

$$M = \frac{1}{12} 3400 \times 4,35^2 = 5400 \text{ Kgm}$$

$$\sigma_c = 62 \text{ Kg/cm}^2$$

$$A_f = 15,2 \text{ cm}^2$$

Sezione 1-2; 2-3;

$$M = \frac{1}{16} 3400 \times 4,35^2 = 4000 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 11,2 \text{ cm}^2$$

Sezione 3-4; 4;

$$M = \frac{1}{14} 3400 \times 2,15^2 = 1100 \text{ Kgm}$$

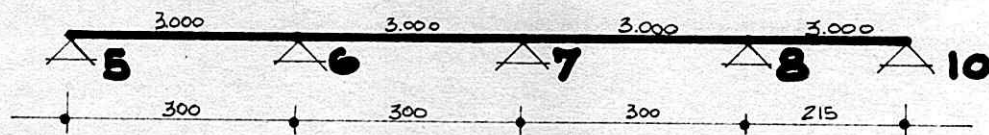
$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 3,2 \text{ cm}^2$$

Taglio massimo $T = 7600 \text{ Kg}$

$$\tau_{\max} = \frac{7600}{28 \times 0,9 \times 80} = 3,7 \text{ Kg/cm}^2$$

Travi n°5-6-7-8-10; 5'-6'-7'-8'-10;



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 5; 6; 7; 8;

$$M = \frac{1}{12} 3000 \times 3,00^2 = 2250 \text{ Kgm}$$

$$\sigma_c = 49 \text{ Kg/cm}^2$$

$$A_f = 6,3 \text{ cm}^2$$

Sezione 5-6; 6-7; 7-8;

$$M = \frac{1}{16} 3000 \times 3,00^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 41 \text{ Kg/cm}^2$$

$$A_f = 4,7 \text{ cm}^2$$

Sezione 8-10; 10;

$$M = \frac{1}{14} 3000 \times 2,15^2 = 1000 \text{ Kgm}$$

$$\sigma_c = 30 \text{ Kg/cm}^2$$

$$A_f = 2,7 \text{ cm}^2$$

Taglio massimo $T = 4500 \text{ Kg}$

$$\tau_{\max} = \frac{4500}{28 \times 0,9 \times 50} = 3,6 \text{ Kg/cm}^2$$

Trave n°12-13-14-15-16-15'-14'-13'-12'



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 12; 13; 14; 15; 16;

$$M = \frac{1}{12} 3400 \times 3,00^2 = 2550 \text{ Kgm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

$$A_f = 7,25 \text{ cm}^2$$

Sezione 12-13; 13-14; 14-15; 15-16;

$$M = \frac{1}{16} 3400 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 5,25 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{28 \times 0,9 \times 50} = 3,95 \text{ Kg/cm}^2$$

Copertura piano tipo

SOLAIO

Solaio $H = 20'' + 5''$

p.p.	160
sovracc. perm.	115
" accid.	200
soletta	125
	600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 4,20 \times 1,05 = 4,40 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{\text{inc}} = \frac{1}{12} 300 \times 4,40^2 = 485 \text{ Kgm}$$

$$\sigma_c = 25 \text{ Kg/cm}^2 \quad A_f = 1,57 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{14} 300 \times 4,40^2 = 415 \text{ Kgm}$$

$$\sigma_c = 23 \text{ Kg/cm}^2 \quad A_f = 1,34 \text{ cm}^2$$

$$l = 3,50 \times 1,50 = 370 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{\text{inc}} = \frac{1}{12} 300 \times 3,70^2 = 340 \text{ Kgm}$$

$$\sigma_c = 21 \text{ Kg/cm}^2 \quad A_f = 1,12 \text{ cm}^2$$

$$M_{\text{camp}} = \frac{1}{14} 300 \times 3,70^2 = 290 \text{ Kgm}$$

$$\sigma_c = 19 \text{ Kg/cm}^2 \quad A_f = 0,95 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$

Analisi di carico

p.p.	100
soletta	100
sovracc; perm.	150
" accid.	200
	550 Kg/ml

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 4,20 \times 1,05 = 440 \text{ m}$$

$$M_{\text{inc}} = \frac{1}{12} 275 \times 4,40^2 = 450 \text{ Kgm}$$

$$M_{\text{camp}} = \frac{1}{14} 275 \times 4,40^2 = 380 \text{ Kgm}$$

$$H = 16''$$

$$b = 50''$$

$$\sigma_c = 43 \text{ Kg/cm}^2$$

$$A_f = 2,50 \text{ cm}^2$$

$$\sigma_c = 39 \text{ Kg/cm}^2$$

$$A_f = 2,1 \text{ cm}^2$$

Sporti

Analisi di carico

p.p.

140

soletta

100

sovracc. perm.

110

" accid.

400

750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml}$$

$$s = 1,20 \text{ m}$$

$$M = \frac{1}{2} 375 \times 1,20^2 = 270 \text{ Kgm}$$

$$H = 25''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 18 \text{ Kg/cm}^2$$

$$A_f = 0,96 \text{ cm}^2$$

Solai di copertura

$$l = 4,20 \times 1,05 = 4,40 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

$$M_{\text{inc}} = 485 \text{ Kgm}$$

$$\sigma_c = 20 \text{ Kg/cm}^2$$

$$A_f = 1,25 \text{ cm}^2$$

$$M_{\text{camp}} = 415 \text{ Kgm}$$

$$\sigma_c = 19 \text{ Kg/cm}^2$$

$$A_f = 1,1 \text{ cm}^2$$

$$l = 3,50 \times 1,05 = 370 \text{ m}$$

$$H = 30''$$

$$b = 50''$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

$$M_{\text{inc}} = 340 \text{ Kgm}$$

$$\sigma_c = 17 \text{ Kg/cm}^2$$

$$A_f = 0,9 \text{ cm}^2$$

$$M_{\text{camp}} = 290 \text{ Kgm}$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 0,75 \text{ cm}^2$$

Sporti

$$M = 270 \text{ Kgm}$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$H = 30''$$

$$\sigma_c = 15 \text{ Kg/cmq}$$

$$b = 50''$$

$$A_f = 0,75 \text{ cmq}$$

Vano scala

- Analisi di carico

gradino

p.p.	$\frac{20+3,5}{2} \times 100 \times 1,00 \times 2500$	300
sovracc. perm.		200
sovracc. accid.		400
		900 Kg/mq

trave a ginocchio

rampa	900 x 1,15	1035
tompagno		700
p.p.	0,50 x 0,25 x 2500 x 1,00	315
		2050 Kg/ml

- Calcolo trave a ginocchio

a flessione

$$M_{inc} = \frac{1}{12} 2050 \times 3,50^2 = 2100 \text{ Kgm} \quad H = 50'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 37 \text{ Kg/cm}^2 \quad A_f = 3,35 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2050 \times 3,50^2 = 1800 \text{ Kgm} \quad H = 50'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 34 \text{ Kg/cm}^2 \quad A_f = 2,85 \text{ cm}^2$$

a torsione

$$m_i = \frac{1}{2} 900 \times 1,15^2 = 595 \text{ Kgm} \quad T_i = 900 \times 1,15 = 1035 \text{ Kg}$$

$$m_t = 595 + 1035 \times 0,125 = 724 \text{ Kgm} \quad M_t = 724 \times \frac{300}{2} = 1085 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{50}{25}} = 4,06 \quad \tau_t = \frac{4,06 \times 1085}{50 \times 25} = 13,9 \text{ Kg/cm}^2$$

- Armatura a torsione $F = 45 \times 20 = 900 \text{ cm}^2$ $U = 2 \times (45 + 20) = 130 \text{ cm}$

$$\Sigma_{fl} = \frac{108500 \times 130}{2 \times 1400 \times 900} = 5,59 \text{ cmq}$$

$$\Sigma_{fs} = \frac{108500}{2 \times 1400 \times 900} = 0,043 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,15^2 \times 0,30 = 180 \text{ Kgm} \quad H = \frac{20+3,5}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 50 \text{ Kg/cmq}$$

$$A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli $H = 25''$

$$q = 800 \text{ Kg/mq}$$

$$l = 2,40 \text{ m}$$

vincolo incastro

$$M_{inc} = \frac{1}{12} 800 \times 2,40^2 = 385 \text{ Kgm} \quad H = 25'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 15 \text{ Kg/cmq}$$

$$A_f = 1,2 \text{ cmq/ml}$$

$$M_{camp} = \frac{1}{14} 800 \times 2,40^2 = 330 \text{ Kgm} \quad H = 25'' \quad b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c < 15 \text{ Kg/cmq}$$

$$A_f = 1,0 \text{ cmq/ml}$$

Copertura torrino

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,40 \times 1,05 = 260 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times 2,60^2 = 130 \text{ Kgm}$$

$$H = 20''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 16 \text{ Kg/cm}^2$$

$$A_f = 0,55 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times 2,60^2 = 190 \text{ Kgm}$$

$$H = 20''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 20 \text{ Kg/cm}^2$$

$$A_f = 0,79 \text{ cm}^2$$

Trave S-11-9-4; S-11'-9'-4';

Analisi di carico

solaio

$$550 \times \frac{2,40}{2}$$

$$= 660$$

p.p.

$$= 340$$

$$\hline 1000 \text{ Kg/ml}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 50''$$

$$b = 25''$$

$$M_{11} = M_9 = M_4 = \frac{1}{12} 1000 \times 3,40^2 = 950 \text{ Kgm} \quad \sigma_c = 24 \text{ Kg/cm}^2 \quad A_f = 1,5 \text{ cm}^2$$

$$M_{11-9} = \frac{1}{10} 1000 \times 3,05^2 = 950 \text{ Kgm} \quad \sigma_c = 24 \text{ Kg/cm}^2 \quad A_f = 1,5 \text{ cm}^2$$

$$M_{9-4} = \frac{1}{14} 1000 \times 3,40^2 = 700 \text{ Kgm} \quad \sigma_c = 20 \text{ Kg/cm}^2 \quad A_f = 1,1 \text{ cm}^2$$

Trave S-11-11'

Analisi di carico

Solaio

$$= 660$$

p.p.

$$= 340$$

$$\hline 1000 \text{ Kg/ml}$$

Carico concentrato

$$1000 \times \frac{3,05}{2} = 1500 \text{ Kg}$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$H = 50''$$

$$b = 25''$$

$$M_{11s} = \frac{1}{2} 1000 \times 1,00^2 + 500 \times 0,40 = 500 + 200 = 700 \text{ Kgm}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,1 \text{ cmq}$$

PALAZZINA TIPO D

Analisi di carico sulle travi

Travi 1-2-3; 1'-2'-3';

Solaio	$600 \times \frac{4,30}{2}$	1300
sovracc. trave	$315 \times 1,00$	300
tompagno		700
p.p.	$1,00 \times 0,25 \times 1,00 \times 2500$	650
		2950 Kg/ml

Trave 3-4-5; 3'-4'-5';

Solaio		1300
sbalzo	$800 \times 0,50$	400
sovracc. trave		300
tompagno		700
p.p.		650
		3350 Kg/ml

Trave 6-7-8-9-10; 6'-7'-8'-9'-10';

Solaio		1300
"	$600 \times \frac{3,50}{2}$	1050
sovracc. perm.	$315 \times 0,70$	250
p.p.		450
		3050 Kg/ml

Trave 10-10'

Solaio		1050
tompagno		700
p.p.		350
		2100 Kg/ml

Trave 11-12; 15-15'; 11'-12';

Solaio	1050
sovracc. trave	250
tompagno	700
p.p.	450
	2450 Kg/ml

Trave 12-13-14-15; 12'-13'-14'-15';

Solaio		1050
balcone	800 x 1,20	950
sovracc. trave		250
tompagno		700
p.p.		450
		3400 Kg/ml

Trave 5-16-10; 5'-16'-10';

Rampa	800 x 1,20	950
tompagno		700
p.p.		350
		2000 Kg/ml

Trave 1-6-11; 1'-6'-11';

Tompagno	700
p.p.	300
	1000 Kg/ml

Analisi di carico sui pilastri

Pilastro 1; 1';

1 - 6	$1000 \times \frac{5,40}{2}$	2700
1 - 2	$2950 \times \frac{3,00}{2}$	4450
p.p.		1350
		8500 Kg

Pilastro 2; 2';

2 - 1		4450
2 - 3	$2950 \times \frac{3,00}{2}$	4450
p.p.		1600
		10500 Kg

Pilastro 3; 3';

3 - 2		4450
3 - 4	$3350 \times \frac{4,00}{2}$	6700
p.p.		1350
		12500 Kg

Pilastro 4; 4';

4 - 3		6700
4 - 5	$3350 \times \frac{2,15}{2}$	3600
p.p.		1200
		11500 Kg

Pilastro 5; 5';

5 - 4		3600
5 - 16	$2000 \times \frac{3,70}{2}$	3700
sbalzo	$2000 \times 0,50$	1000
p.p.		1200
		9500 Kg

Pilastro 6; 6';

1 - 6		2700
6 - 7	$3050 \times \frac{3,00}{2}$	4600
6 - 11	$1000 \times \frac{4,30}{2}$	2150
p.p.		1550
		11000 Kg

Pilastro 7; 7';

7 - 6		4600
7 - 8	$3050 \times \frac{3,35}{2}$	5100
p.p.		1300
		11000 Kg

Pilastro 8; 8';

8 - 7		5100
8 - 9	$3050 \times \frac{2,60}{2}$	4000
p.p.		1400
		10500 Kg

Pilastro 9; 9';

9 - 8		4000
9 - 10	$3050 \times \frac{3,15}{2}$	4800
p.p.		1200
		10000 Kg

Pilastro 10; 10';

10 - 9

4800

10 - 10'

$$2100 \times \frac{2,80}{2}$$

2950

p.p.

1250

9000 Kg**Pilastro 11; 11';**

11 - 6

2150

11 - 12

$$2450 \times \frac{3,00}{2}$$

3700

p.p.

1150

7000 Kg**Pilastro 12; 12';**

12 - 11

3700

12 - 13

$$3400 \times \frac{3,00}{2}$$

5100

p.p.

1200

10000 Kg**Pilastro 13; 14; 13'; 14';**

13 - 12

5100

13 - 14

$$3400 \times \frac{3,00}{2}$$

5100

p.p.

1300

11500 Kg**Pilastro 15; 15';**

15 - 14

$$3400 \times \frac{3,00}{2}$$

5100

15 - 15'

$$2450 \times \frac{3,00}{2}$$

3700

p.p.

1200

10000 Kg

Pilastro 16; 16';

16 - 5

$$2000 \times \frac{3,70}{2}$$

3700

16 - 10

$$2000 \times \frac{1,75}{2}$$

1750

p.p.

1050

6500 Kg

Armatura travi rovesce

- Analisi di carico sul terreno -

pilastrì	1.284.000 Kg
p.p. travi	166.000 Kg
	1.450.000 Kg

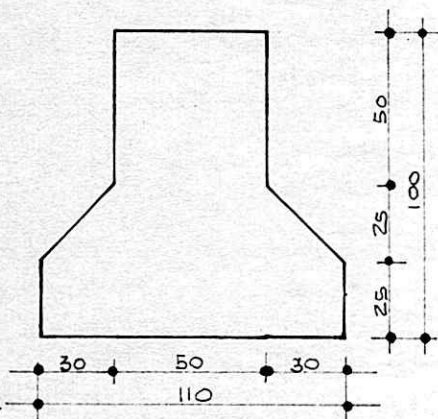
- Torsione sul terreno -

$$\sigma_t = \frac{1.450.000}{1.022.300} = 1,41 \text{ Kg/cm}^2$$

Trave 1-2-3-4-5-5'-4'-3'-2'-1'

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave

$$q = \frac{1.284.000}{1.022.000} \times 100 \times 110 = 13700 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{inc} = \frac{1}{12} 13700 \times 4,00^2 = 18300 \text{ Kgm}$$

$$H = 100''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 39 \text{ Kg/cm}^2$$

$$A_f = 14,6 \text{ cm}^2$$

$$M_{camp} = 18300 \text{ Kgm}$$

$$H = 100''$$

$$b = 110''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 14,3 \text{ cm}^2$$

- Armatura trasversale

$$M = \frac{1}{2} 13700 \times 0,30^2 = 600 \text{ Kgm}$$

$$H = 50''$$

$$b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 2,6 \text{ cm}^2$$

Travi n°6-7-8-9-10-10'-9'-8'-7'-6'; 11-12-13-14-15-15'-14'-13'-12'-11'

$$M_{inc} = \frac{1}{12} 13700 \times \overline{3,00}^2 = 10300 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 28 \text{ Kg/cm}^2 \quad A_f = 8,1 \text{ cm}^2$$

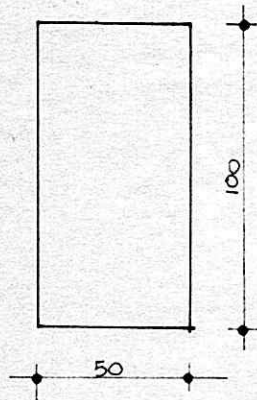
$$M_{camp} = 10300 \text{ Kgm} \quad H = 100'' \quad b = 110''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 18 \text{ Kg/cm}^2 \quad A_f = 7,9 \text{ cm}^2$$

Travi n°1-6-11; 1'-6'-11'; 5-16-10; 5'-6'-10';

- Caratteristiche geometriche -

vedi disegno



- Carico sulla trave -

$$q = 1,25 \times 100 \times 50 = 6250 \text{ Kg/ml}$$

- Armatura a flessione

$$M_{camp} = M_{inc} = \frac{1}{12} 6250 \times \overline{5,40}^2 = 15200 \text{ Kgm} \quad H = 100'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 34 \text{ Kg/cm}^2 \quad A_f = 11,7 \text{ cm}^2$$

SEZIONE ED ARMATURA PILASTRI PIANO TERRA E FONDAZIONI

N°	P/tn	A' _c / cmq	A _f / cmq	armatura	A _c / cmxcm	A _{ci} / cmq	ρ/cm ²
1; 1';	34	700	5,6	10 ∅12	∅ 50	2075	17
2; 2';	42	860	6,9	10 ∅12	∅ 50	2075	20
3; 3';	50	1030	8,3	10 ∅12	∅ 50	2075	24
4; 4';	46	950	7,6	10 ∅12	∅ 50	2075	22
5; 5';	38	780	6,3	8 ∅12	25 x 40	1090	35
6; 6';	44	910	7,3	10 ∅12	∅ 50	2075	21
7; 7';	44	910	7,3	10 ∅12	∅ 50	2075	21
8; 8';	42	860	6,9	10 ∅12	35 x 35	1338	31
9; 9';	40	820	6,5	10 ∅12	35 x 35	1338	30
10; 10';	36	740	5,9	8 ∅12	25 x 40	1090	33
11; 11';	28	580	4,7	10 ∅12	∅ 50	2075	14
12; 12';	40	820	6,6	10 ∅12	∅ 50	2075	20
13;13'; 14;14';	46	950	7,6	10 ∅12	∅ 50	2075	22
15; 15'	40	820	6,6	10 ∅12	∅ 50	2075	20
16; 16'	26	540	4,3	8 ∅12	25 x 40	1090	24

Staffe ∅ 8'''/15''

SEZIONE ED ARMATURA PILASTRI PIANO I°

pil.n°	sezione	armatura
1; 1';	35 x 35	8 $\varnothing$ 12
2; 2';	35 x 35	8 $\varnothing$ 12
3; 3';	35 x 35	8 $\varnothing$ 12
4; 4';	35 x 35	8 $\varnothing$ 12
5; 5';	25 x 40	8 $\varnothing$ 12
6; 6';	35 x 35	8 $\varnothing$ 12
7; 7';	35 x 35	8 $\varnothing$ 12
8; 8';	35 x 35	8 $\varnothing$ 12
9; 9';	35 x 35	8 $\varnothing$ 12
10; 10';	25 x 40	8 $\varnothing$ 12
11; 11';	35 x 35	8 $\varnothing$ 12
12; 12';	35 x 35	8 $\varnothing$ 12
13; 13'; 14; 14;	35 x 35	8 $\varnothing$ 12
15; 15';	35 x 35	8 $\varnothing$ 12
16; 16';	25 x 40	8 $\varnothing$ 12

Staffe $\varnothing$ 6"/15"

SEZIONE ED ARMATURA PILASTRI PIANO II° e III°

pil. n°	sezione	armatura
1; 1';	30 x 30	8 $\varnothing$ 10
2; 2';	30 x 30	8 $\varnothing$ 10
3; 3';	30 x 30	8 $\varnothing$ 10
4; 4';	30 x 30	8 $\varnothing$ 10
5; 5';	25 x 30	8 $\varnothing$ 10
6; 6';	30 x 30	8 $\varnothing$ 10
7; 7';	30 x 30	8 $\varnothing$ 10
8; 8';	30 x 30	8 $\varnothing$ 10
9; 9';	30 x 30	8 $\varnothing$ 10
10; 10';	25 x 30	8 $\varnothing$ 10
11; 11';	30 x 30	8 $\varnothing$ 10
12; 12';	30 x 30	8 $\varnothing$ 10
14; 14'; 13; 13';	30 x 30	8 $\varnothing$ 10
15; 15';	30 x 30	8 $\varnothing$ 10
16; 16';	25 x 30	8 $\varnothing$ 10

Staffe $\varnothing$ 6'''/15'

Travi n°1-2-3-4-5; 1'-2'-3'-4'-5';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 100''$$

Sezione 1; 1-2;

$$M = \frac{1}{14} 2950 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 6,3 \text{ cm}^2$$

Sezione 2

$$M = \frac{1}{12} 2950 \times 3,00^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cm}^2$$

$$A_f = 7,4 \text{ cm}^2$$

Sezione 2 - 3

$$M = \frac{1}{16} 2950 \times 3,00^2 = 1650 \text{ Kgm}$$

$$\sigma_c = 34 \text{ Kg/cm}^2$$

$$A_f = 5,5 \text{ cm}^2$$

Sezione 3; 4;

$$M = \frac{1}{12} 3350 \times 4,00^2 = 4450 \text{ Kgm}$$

$$\sigma_c = 61 \text{ Kg/cm}^2$$

$$A_f = 15,2 \text{ cm}^2$$

Sezione 3 - 4

$$M = \frac{1}{16} 3350 \times 4,00^2 = 3350 \text{ Kgm}$$

$$\sigma_c = 52 \text{ Kg/cm}^2$$

$$A_f = 11,5 \text{ cm}^2$$

Sezione 4-5; 5;

$$M = \frac{1}{14} 3350 \times 2,10^2 = 1050 \text{ Kgm}$$

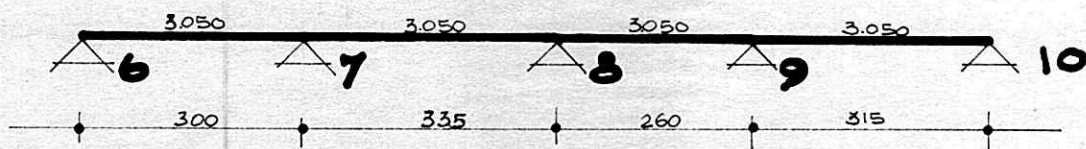
$$\sigma_c = 27 \text{ Kg/cm}^2$$

$$A_f = 3,5 \text{ cm}^2$$

Taglio massimo $T = 6700 \text{ Kg}$

$$\tau_{\max} = \frac{6700}{23 \times 0,9 \times 100} = 3,2 \text{ Kg/cm}^2$$

Travi n° 6-7-8-9-10; 6'-7'-8'-9'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 6; 6-7;

$$M = \frac{1}{14} 3050 \times 3,00^2 = 2000 \text{ Kgm}$$

$$\sigma_c = 47 \text{ Kg/cm}^2$$

$$A_f = 6,8 \text{ cm}^2$$

Sezione 7; 8;

$$M = \frac{1}{12} 3050 \times 3,35^2 = 2850 \text{ Kgm}$$

$$\sigma_c = 58 \text{ Kg/cm}^2$$

$$A_f = 9,8 \text{ cm}^2$$

Sezione 7 - 8

$$M = \frac{1}{16} 3050 \times 3,35^2 = 2150 \text{ Kgm}$$

$$\sigma_c = 49 \text{ Kg/cm}^2$$

$$A_f = 7,3 \text{ cm}^2$$

Sezione 8 - 9

$$M = \frac{1}{16} 3050 \times 2,60^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 4,4 \text{ cm}^2$$

Sezione 9; 10;

$$M = \frac{1}{12} 3050 \times 3,15^2 = 2500 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 8,6 \text{ cm}^2$$

Sezione 9 - 10

$$M = \frac{1}{16} 3050 \times 3,15^2 = 1900 \text{ Kgm}$$

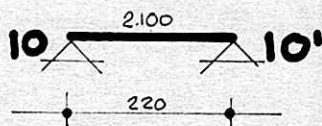
$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{23 \times 0,9 \times 70} = 3,5 \text{ Kg/cm}^2$$

Trave n°10 - 10'



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 40''$$

$$b = 25 \text{ cm}$$

Sezione 10; 10';

$$M = \frac{1}{12} 2100 \times 2,70^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 37 \text{ Kg/cm}^2$$

$$A_f = 2,6 \text{ cm}^2$$

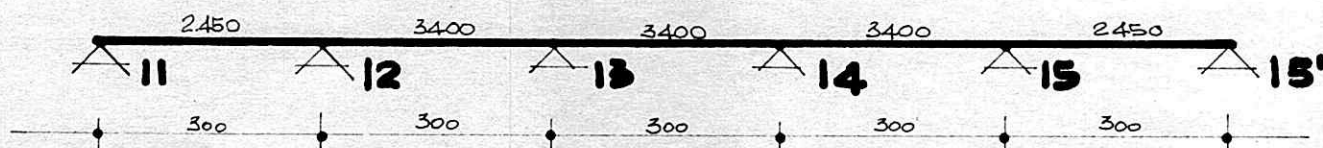
Sezione 10 - 10';

$$M = \frac{1}{16} 2100 \times 2,70^2 = 950 \text{ Kgm}$$

$$\sigma_c = 31 \text{ Kg/cm}^2$$

$$A_f = 1,95 \text{ cm}^2$$

Travi n°11-12-13-14-15-15'-14'-13'-12'-11';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 70''$$

Sezione 11; 11-12;

$$M = \frac{1}{14} 2450 \times 3,00^2 = 1600 \text{ Kgm}$$

$$\sigma_c = 41 \text{ Kg/cm}^2$$

$$A_f = 5,4 \text{ cm}^2$$

Sezione 12; 13; 14; 15;

$$M = \frac{1}{12} 3400 \times 3,00^2 = 2550 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 8,7 \text{ cm}^2$$

Sezione 12-13; 13-14; 14-15;

$$M = \frac{1}{16} 3400 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 46 \text{ Kg/cm}^2$$

$$A_f = 6,5 \text{ cm}^2$$

Sezione 15 - 15';

$$M = \frac{1}{16} 2450 \times 3,00^2 = 1400 \text{ Kgm}$$

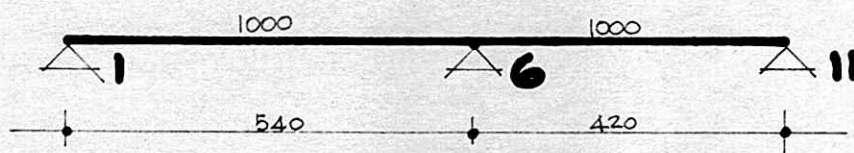
$$\sigma_c = 38 \text{ Kg/cm}^2$$

$$A_f = 4,7 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{70 \times 0,9 \times 23} = 3,5 \text{ Kg/cm}^2$$

Trave n°1-6-11; 1'-6'-11';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

Sezione 1; 1 - 6;

$$M = \frac{1}{14} 1000 \times 5,40^2 = 2100 \text{ Kgm}$$

$$\sigma_c = 60 \text{ Kg/cm}^2$$

$$A_f = 7,3 \text{ cm}^2$$

Sezione 6

$$M = \frac{1}{12} 1000 \times 5,40^2 = 2400 \text{ Kgm}$$

$$\sigma_c = 64 \text{ Kg/cm}^2$$

$$A_f = 8,3 \text{ cm}^2$$

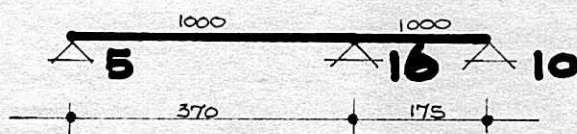
Sezione 6-11; 11;

$$M = \frac{1}{14} 1000 \times 4,20^2 = 1300 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 4,4 \text{ cm}^2$$

Trave n° 5-16-10; 5'-16'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 25''$$

Sezione 5; 16;

$$M = \frac{1}{12} 1000 \times \overline{3,70}^2 = 1150 \text{ Kgm}$$

$$\sigma_c = 62 \text{ Kg/cm}^2$$

$$A_f = 4 \text{ cm}^2$$

Sezione 5 - 16

$$M = \frac{1}{14} 1000 \times \overline{3,70}^2 = 1000 \text{ Kgm}$$

$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 3,4 \text{ cm}^2$$

Sezione 16-10; 10;

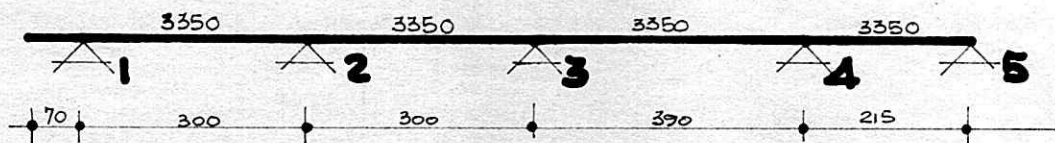
$$M = \frac{1}{14} 1000 \times \overline{1,75}^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 24 \text{ Kg/cm}^2$$

$$A_f = 0,8 \text{ cm}^2$$

Copertura

Travi n°1-2-3-4-5; 1'-2'-3'-4'-5';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 80''$$

Sezione 1; 2;

$$M = \frac{1}{12} 3350 \times 3,00^2 = 2550 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cm}^2$$

$$A_f = 7,1 \text{ cm}^2$$

Sezione 1-2; 2-3;

$$M = \frac{1}{16} 3350 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 34 \text{ Kg/cm}^2$$

$$A_f = 5,2 \text{ cm}^2$$

Sezione 3; 4;

$$M = \frac{1}{12} 3350 \times 3,90^2 = 4250 \text{ Kgm}$$

$$\sigma_c = 54 \text{ Kg/cm}^2$$

$$A_f = 12,0 \text{ cm}^2$$

Sezione 3-4;

$$M = \frac{1}{16} 3350 \times 3,90^2 = 3200 \text{ Kgm}$$

$$\sigma_c = 45 \text{ Kg/cm}^2$$

$$A_f = 8,8 \text{ cm}^2$$

Sezione 4-5; 5;

$$M = \frac{1}{14} 3350 \times 2,15^2 = 1100 \text{ Kgm}$$

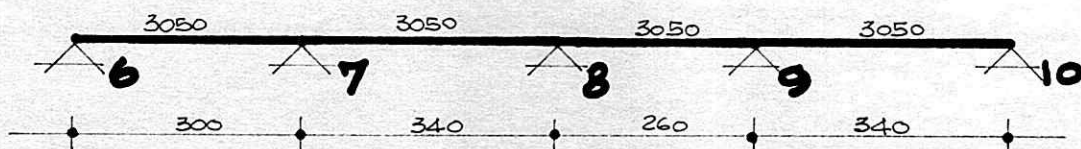
$$\sigma_c = 25 \text{ Kg/cm}^2$$

$$A_f = 3 \text{ cm}^2$$

$$\text{Taglio massimo } T = 6500 \text{ Kg}$$

$$\tau_{\max} = \frac{6500}{28 \times 0,9 \times 80} = 3,2 \text{ Kg/cm}^2$$

Travi n° 6-7-8-9-10; 6'-7'-8'-9'-10';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 6;

$$M = \frac{1}{12} 3050 \times \overline{3,00}^2 = 2300 \text{ Kgm}$$

$$\sigma_c = 49 \text{ Kg/cm}^2$$

$$A_f = 6,4 \text{ cm}^2$$

Sezione 6 - 7

$$M = \frac{1}{16} 3050 \times \overline{3,00}^2 = 1700 \text{ Kgm}$$

$$\sigma_c = 41 \text{ Kg/cm}^2$$

$$A_f = 4,7 \text{ cm}^2$$

Sezione 7; 8; 9; 12;

$$M = \frac{1}{12} 3050 \times \overline{3,40}^2 = 2950 \text{ Kgm}$$

$$\sigma_c = 57 \text{ Kg/cm}^2$$

$$A_f = 8,3 \text{ cm}^2$$

Sezione 7-8; 9-10;

$$M = \frac{1}{16} 3050 \times \overline{3,40}^2 = 2200 \text{ Kgm}$$

$$\sigma_c = 48 \text{ Kg/cm}^2$$

$$A_f = 6,2 \text{ cm}^2$$

Sezione 8 - 9;

$$M = \frac{1}{16} 3050 \times \overline{2,60}^2 = 1300 \text{ Kgm}$$

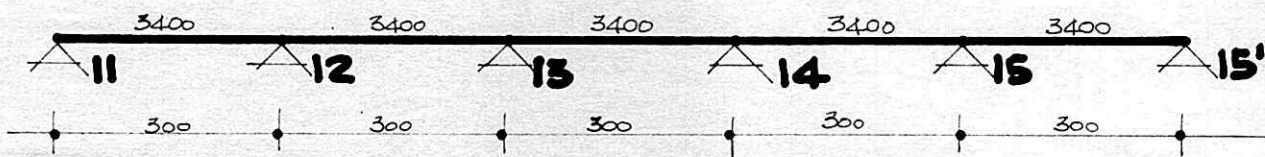
$$\sigma_c = 35 \text{ Kg/cm}^2$$

$$A_f = 3,5 \text{ cm}^2$$

Taglio massimo $T = 5200 \text{ Kg}$

$$\tau_{\max} = \frac{5200}{28 \times 0,9 \times 50} = 4,05 \text{ Kg/cm}^2$$

Trave n°11-12-13-14-15-15'-14'-13'-12'-11';



Armatura a flessione

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 30''$$

$$b = 50''$$

Sezione 11; 12; 13; 14; 15;

$$M = \frac{1}{12} 3400 \times 3,00^2 = 2550 \text{ Kgm}$$

$$\sigma_c = 53 \text{ Kg/cm}^2$$

$$A_f = 7,2 \text{ cm}^2$$

Sezione 11-12; 12-13; 13-14; 14-15;

$$M = \frac{1}{16} 3400 \times 3,00^2 = 1900 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cm}^2$$

$$A_f = 5,25 \text{ cm}^2$$

Taglio massimo $T = 5100 \text{ Kg}$

$$\tau_{\max} = \frac{5100}{28 \times 0,9 \times 50} = 4,1 \text{ Kg/cm}^2$$

Copertura piano tipo solai

Solaio $H = 20'' + 5''$

p.p.	160
soletta	125
sovracc. perm.	115
sovracc. accid.	200
	600 Kg/mq

$$q = 600 \times 0,50 = 300 \text{ Kg/ml}$$

$$l = 4,30 \times 1,05 = 4,50 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 4,50^2 = 500 \text{ Kgm}$$

$$\sigma_c = 26 \text{ Kg/cm}^2$$

$$A_f = 1,60 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 4,50^2 = 430 \text{ Kgm}$$

$$\sigma_c = 24 \text{ Kg/cm}^2$$

$$A_f = 1,38 \text{ cm}^2$$

$$l = 3,50 \times 1,05 = 3,70 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cm}^2$$

$$H = 25''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 300 \times 3,70^2 = 340 \text{ Kgm}$$

$$\sigma_c = 21 \text{ Kg/cm}^2$$

$$A_f = 1,12 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 300 \times 3,70^2 = 290 \text{ Kgm}$$

$$\sigma_c = 19 \text{ Kg/cm}^2$$

$$A_f = 0,95 \text{ cm}^2$$

Zone ribassate $H = 12'' + 4''$

p.p.	100
soletta	100
sovracc. perm.	150
sovracc. accid.	200
	550 Kg/mq

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 450 \text{ m}$$

$$H = 16''$$

$$b = 50''$$

$$M_{inc} = \frac{1}{12} 275 \times 4,50^2 = 460 \text{ Kgm}$$

$$\sigma_c = 44 \text{ Kg/cmq}$$

$$A_f = 2,55 \text{ cmq}$$

$$M_{camp} = \frac{1}{14} 275 \times 4,50^2 = 390 \text{ Kgm}$$

$$\sigma_c = 40 \text{ Kg/cmq}$$

$$A_f = 2,15 \text{ cmq}$$

Sporti

p.p.

140

soletta

100

sovracc. perm.

110

sovracc. accid.

400

 750 Kg/mq

$$q = 750 \times 0,50 = 375 \text{ Kg/ml}$$

$$s = 1,20 \text{ m}$$

$$M = \frac{1}{2} 375 \times 1,20^2 = 270 \text{ Kgm}$$

$$H = 25''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 18 \text{ Kg/cmq}$$

$$A_f = 0,96 \text{ cmq}$$

Solai di copertura

$$l = 4,50 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cmq}$$

$$H = 30''$$

$$b = 50''$$

$$M_{inc} = 500 \text{ Kgm}$$

$$\sigma_c = 21 \text{ Kg/cmq}$$

$$A_f = 1,3 \text{ cmq}$$

$$M_{camp} = 420 \text{ Kgm}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,15 \text{ cmq}$$

$$l = 3,70 \text{ m}$$

$$\text{per } \sigma_f = 1400 \text{ Kg/cmq}$$

$$H = 30''$$

$$b = 50''$$

$$M_{inc} = 340 \text{ Kgm}$$

$$\sigma_c = 17 \text{ Kg/cmq}$$

$$A_f = 0,9 \text{ cmq}$$

$$M_{camp} = 290 \text{ Kgm}$$

$$\sigma_c = 15 \text{ Kg/cmq}$$

$$A_f = 0,75 \text{ cmq}$$

Sporti

$$M = 270 \text{ Kgm}$$

$$H = 30''$$

$$b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2$$

$$\sigma_c = 15 \text{ Kg/cm}^2$$

$$A_f = 0,75 \text{ cm}^2$$

Vano scala

Analisi di carico

- gradino

p.p.	$\frac{20+3,5}{2} \times 100 \times 100 \times 2500$	300
sovracc. perm.		200
sovracc. accid.		400
		900 Kg/mq

- Trave a ginocchio

rampa	900 x 1,15	1035
tompagno		700
p.p.	0,60 x 0,25 x 1,00 x 2500	365
		2100 Kg/ml

Calcolo trave a ginocchio

- a flessione

$$M_{inc} = \frac{1}{12} 2100 \times 3,70^2 = 2400 \text{ Kgm} \quad H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 33 \text{ Kg/cm}^2 \quad A_f = 3,2 \text{ cm}^2$$

$$M_{camp} = \frac{1}{14} 2100 \times 3,70^2 = 2050 \text{ Kgm} \quad H = 60'' \quad b = 25''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 30 \text{ Kg/cm}^2 \quad A_f = 2,7 \text{ cm}^2$$

- a torsione

$$m_i = \frac{1}{2} 900 \times 1,15^2 = 595 \text{ Kgm} \quad t_i = 900 \times 1,15 = 1035 \text{ Kg}$$

$$m_t = 595 + 1035 \times 0,125 = 724 \text{ Kgm} \quad M_t = 724 \times \frac{3,50}{2} = 1270 \text{ Kgm}$$

$$\psi = 3 + \frac{2,6}{0,45 + \frac{60}{25}} = 3,91 \quad \tau_t = \frac{3,91 \times 127000}{60 \times 25} = 13,24 \text{ Kg/cm}^2$$

- Armatura a torsione $F = 55 \times 20 = 1100 \text{ cm}^2$ $U = 2(55+20) = 150 \text{ cm}$

$$\Sigma_{fs} = \frac{127000 \times 150}{2 \times 1400 \times 1100} = 6,15 \text{ cmq}$$

$$\Sigma_{fs} = \frac{127000}{2 \times 1400 \times 1100} = 0,041 \text{ cmq/cm}$$

- Armatura gradino

$$M = \frac{1}{2} 900 \times 1,15^2 \times 0,30 = 180 \text{ Kgm} \quad H = \frac{20+3,5}{2} = 11,5'' \quad b = 30''$$

$$\sigma_f = 1400 \text{ Kg/cmq} \quad \sigma_c = 50 \text{ Kg/cmq} \quad A_f = 1,47 \text{ cmq}$$

- Armatura pianerottoli

$$H = 20''$$

$$b = 100''$$

$$q = 800 \text{ Kg/cmq}$$

$$l = 2,40 \text{ m}$$

vincolo incastro

$$M_{inc} = \frac{1}{12} 800 \times 2,40^2 = 385 \text{ Kgm}$$

$$H = 20''$$

$$b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 20 \text{ Kg/cmq}$$

$$A_f = 1,6 \text{ cmq/ml}$$

$$M_{camp} = \frac{1}{14} 800 \times 2,40^2 = 330 \text{ Kgm}$$

$$H = 20''$$

$$b = 100''$$

$$\sigma_f = 1400 \text{ Kg/cmq}$$

$$\sigma_c = 18 \text{ Kg/cmq}$$

$$A_f = 1,34 \text{ cmq/ml}$$

Copertura vani tecnici

Solaio

$$q = 550 \times 0,50 = 275 \text{ Kg/ml}$$

$$l = 2,40 \times 1,05 = 2,60 \text{ m}$$

$$M_{inc} = \frac{1}{14} 275 \times 2,60^2 = 130 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 16 \text{ Kg/cm}^2 \quad A_f = 0,55 \text{ cm}^2$$

$$M_{camp} = \frac{1}{10} 275 \times 2,60^2 = 190 \text{ Kgm} \quad H = 20'' \quad b = 50''$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 20 \text{ Kg/cm}^2 \quad A_f = 0,79 \text{ cm}^2$$

Trave 10-16-5; 10'-16'-5';

- Analisi di carico -

solaio	$550 \times \frac{2,40}{2}$	= 660
P.P.		= 340
		1000 Kg/ml

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad H = 50'' \quad b = 25''$$

$$M_{16} = M_5 = \frac{1}{12} 1000 \times 3,50^2 = 1000 \text{ Kgm}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 25 \text{ Kg/cm}^2 \quad A_f = 1,6 \text{ cm}^2$$

$$M_{16-5} = \frac{1}{14} 1000 \times 3,50^2 = 850 \text{ Kgm}$$

$$\sigma_f = 1400 \text{ Kg/cm}^2 \quad \sigma_c = 22 \text{ Kg/cm}^2 \quad A_f = 1,3 \text{ cm}^2$$